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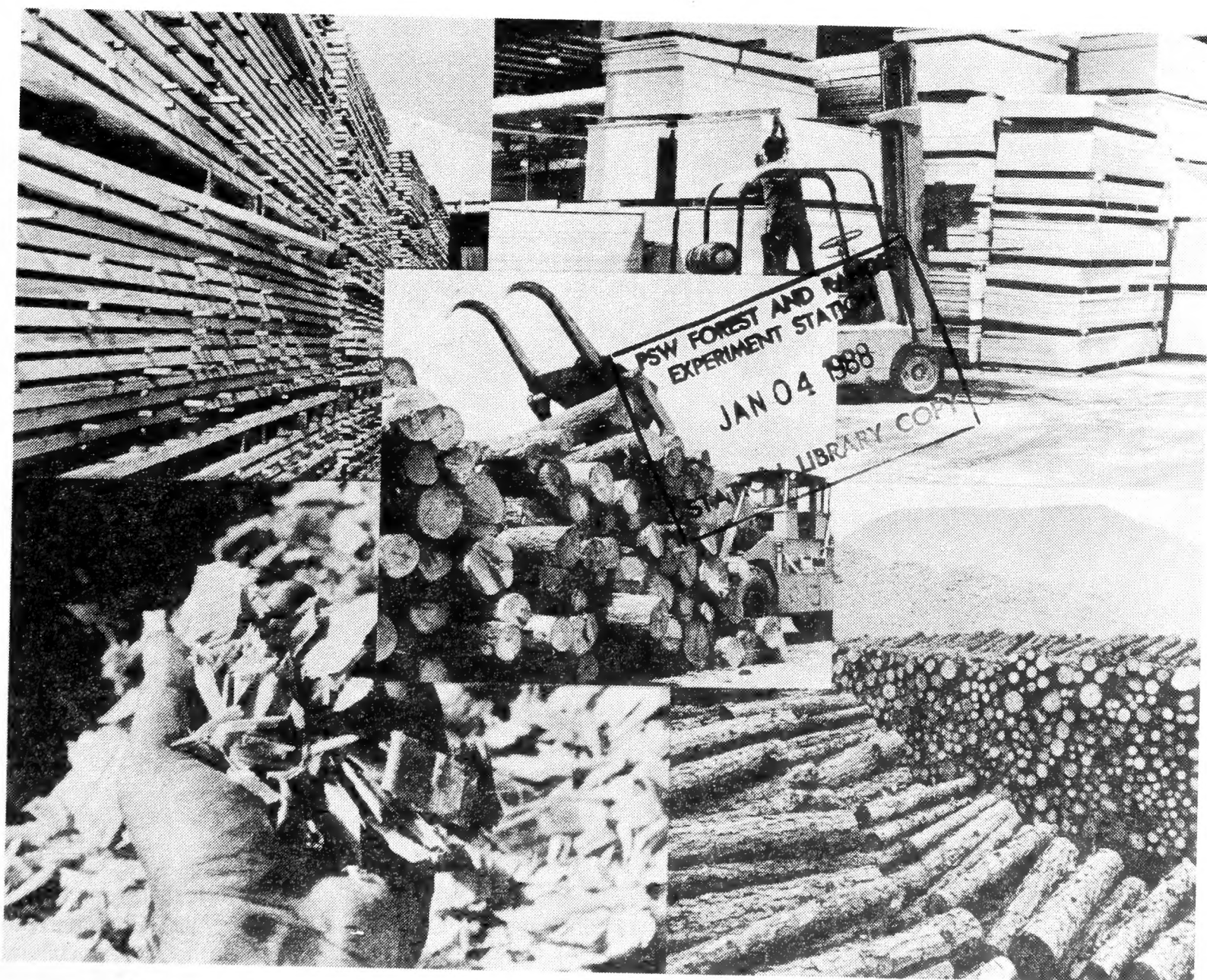
Pacific Northwest
Research Station

Research Paper
PNW-RP-389



TEXAS' Forest Products Industry: Performance and Contribution to the State's Economy, 1970 to 1980

Con H Schallau, Wilbur R. Maki, Bennett B. Foster, and Clair H. Redmond



Abbreviations

States

AL	Alabama
AR	Arkansas
FL	Florida
GA	Georgia
KY	Kentucky
LA	Louisiana
MS	Mississippi
NC	North Carolina
OK	Oklahoma
SC	South Carolina
TN	Tennessee
TX	Texas
VA	Virginia
SO	South
US	United States

Industries

FPI	Forest Products Industry
LWP	Lumber and Wood Products
PAP	Paper and Allied Products
WF	Wood Furniture

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Abstract

Schallau, Con H; Maki, Wilbur R.; Foster, Bennett B.; Redmond, Clair H. 1987. Texas' forest products industry: performance and contribution to the State's economy, 1970 to 1980. Res. Pap. PNW-RP-389. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 22 p.

Even though Texas consumes more forest products than it produces, its forest products industry has a conspicuous record. Between 1970 and 1980, employment in the forest products industry increased by 12,000. Only one Southern State, North Carolina, showed a larger absolute gain. Texas was also second to North Carolina in improving its comparative advantage during the 1970's. In 1977, it ranked fourth among the 13 Southern States in value added, but first in growth of value added.

Keywords: Forest products industries, economics (forest products industries), employment (forest products industries), Texas.

Preface

This report briefly describes Texas' forest products industry—its composition, location, evolution, and relation to economic activity elsewhere in the State, the South, and the Nation.

This is one in a series of reports for each of the 13 Southern States. These reports are companions to an analysis of the interregional competition in the forest products industries of the South and the Pacific Northwest.

Estimates of employment and earnings shown in this report were derived from U.S. Department of Commerce data. All references to dollar amounts are in constant 1977 dollars.

Highlights

Throughout the 1970's, Texas' forest products industry exhibited phenomenal growth by many measures.

- Twelve thousand new jobs were created in the industry (a 25-percent increase). Had the growth been the same as for the Nation, the State's forest products industry would have had 10,000 fewer new jobs. Only North Carolina added more jobs, and only Oklahoma had greater proportional growth.
- The forest products industry is composed of paper and allied products, lumber and wood products, and wood furniture manufacturing. Employment in the lumber and wood products segment grew fastest—a 62-percent increase.
- The value added by the forest products industry increased 38 percent between 1972 and 1977. Lumber and wood products exhibited the most growth. Value added by manufacturing totaled \$400 million in 1977—fourth highest in the South.
- Productivity (measured as value added minus payroll) grew more rapidly in Texas than for the South as a whole. This growth was second only to Alabama's and means that Texas has become more efficient and more competitive.
- In 1980, the Texas forest products industry did not qualify as an economic base (or basic) industry, indicating that Texas was not self-sufficient in forest products; imports exceeded exports. This means the industry did not drive the economy by bringing in new dollars from outside markets.

- In some sub-State areas, the forest products industry does qualify as basic. The Nacogdoches area, including 12 surrounding counties, was the most timber-dependent region of the State, and accounted for 15 percent of the State's employment in the forest products industry.
- The importance of the forest products industry is concealed because a significant segment of secondary processing activity is located in the highly urbanized Houston-Beaumont and Dallas-Fort Worth areas.
- In increased shares of both employment and earnings, Texas was second only to North Carolina in improving its comparative advantage during the 1970's.

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The Forest Products Economy of Texas

The Work Force

Texas' estimated full- and part-time work force in 1980 was comprised of an estimated 6.94 million employees and proprietors (see table 1 for sources of employment and earnings data). Texas' work force grew significantly faster between 1970 and 1980 than did the national average (44.7 versus 22.3 percent). Total earnings—wage and salary payments and proprietorial income—grew much faster than the national average; measured in constant 1977 dollars, the State's earnings increased by 67.2 percent compared with 27.4 percent for the Nation. The following tabulation shows that services, manufacturing, retail trade, and State and local government were the State's four largest employer categories.

Employers	Percent of total employment, 1980	
	Texas	U.S.
Major industries:		
Services	16.2	18.2
Manufacturing (including the the forest products industry ¹)	15.1	19.2
Retail trade	14.7	14.2
State and local government	11.8	12.6
Self-employed	6.7	6.6
Construction	6.1	4.1
Wholesale trade	6.0	5.0
Transportation	5.2	4.8
Agriculture	4.9	4.4
Finance, insurance, and real estate	4.8	5.0
Mining	3.4	1.0
Federal military	2.7	2.3
Federal civilian	2.4	2.8
Total ²	100.0	100.0

¹ The forest products industry has three segments: (1) lumber and wood products (SIC 24), except mobile homes (SIC 2451); (2) wood furniture manufacturing (SIC 2511, 2512, 2517, 2521, 2541); and (3) paper and allied products (SIC 26).

² Sum of parts may not equal totals because of rounding.

Components of the Economic Base

Along with total employment, there is another and perhaps more important way to judge an industry's contribution to the economy of Texas. For the State's economy to grow and develop, it must attract new dollars so residents can buy goods and services produced elsewhere. The industries that export products and services beyond local boundaries (that is, to elsewhere in the State, to other States, and to the world) and bring in new dollars constitute the area's economic base. Generally speaking, most manufacturing employment is classified as economic base (or basic); service or residentiary employment (for example, barber shops, realty firms, schools, and local government) is geared primarily to producing for local needs. Some services may, however, be basic. The Federal military, for example, provides national defense for all the Nation's citizens, and taxpayers outside Texas provide the financial support; Federal military therefore is one of Texas' basic industries.

Residentiary employment is supported by the economic base. Money flowing in provides income for wage earners and entrepreneurs to spend on locally purchased goods and services. The economic growth of a region usually depends on the success of its economic base.

We used the excess employment technique to identify the industries that comprise Texas' (or a sub-State district's) economic base. This approach accepts the national distribution of employment among industries as a norm. Any industry with employment in excess of this norm is considered to be producing for markets outside the State (or sub-State district) and is part of Texas' economic base. The percentage of Texas' excess employment served as an indicator of the State's dependency on a particular industry for generating new dollars from outside the State (table 2 shows how excess employment and industry dependency indicators for Texas were calculated).

In 1980, eight industries accounted for 89.4 percent of the State's excess employment—that is, its economic base (see tabulation below). These same industries accounted for a significantly smaller share (74.3 percent) in 1970. This change reflects some rather large shifts in the shares of certain industries. In 1970, agriculture and Federal military accounted for 25 percent of the State's basic employment; by 1980, they accounted for only 11.6 percent. The declining importance of the Federal military segment coincided with the cessation of the Nation's military involvement in Vietnam. At the same time, the oil and gas extraction and construction components of the economic base increased in importance, reflecting the rapid expansion of domestic oil production during the 1970's. More recently, OPEC (Organization of Petroleum Exporting Countries) oil prices have declined, and domestic exploration for and production of oil have declined significantly in Texas. The relative importance of the various components of the State's economic base have been altered since 1980.

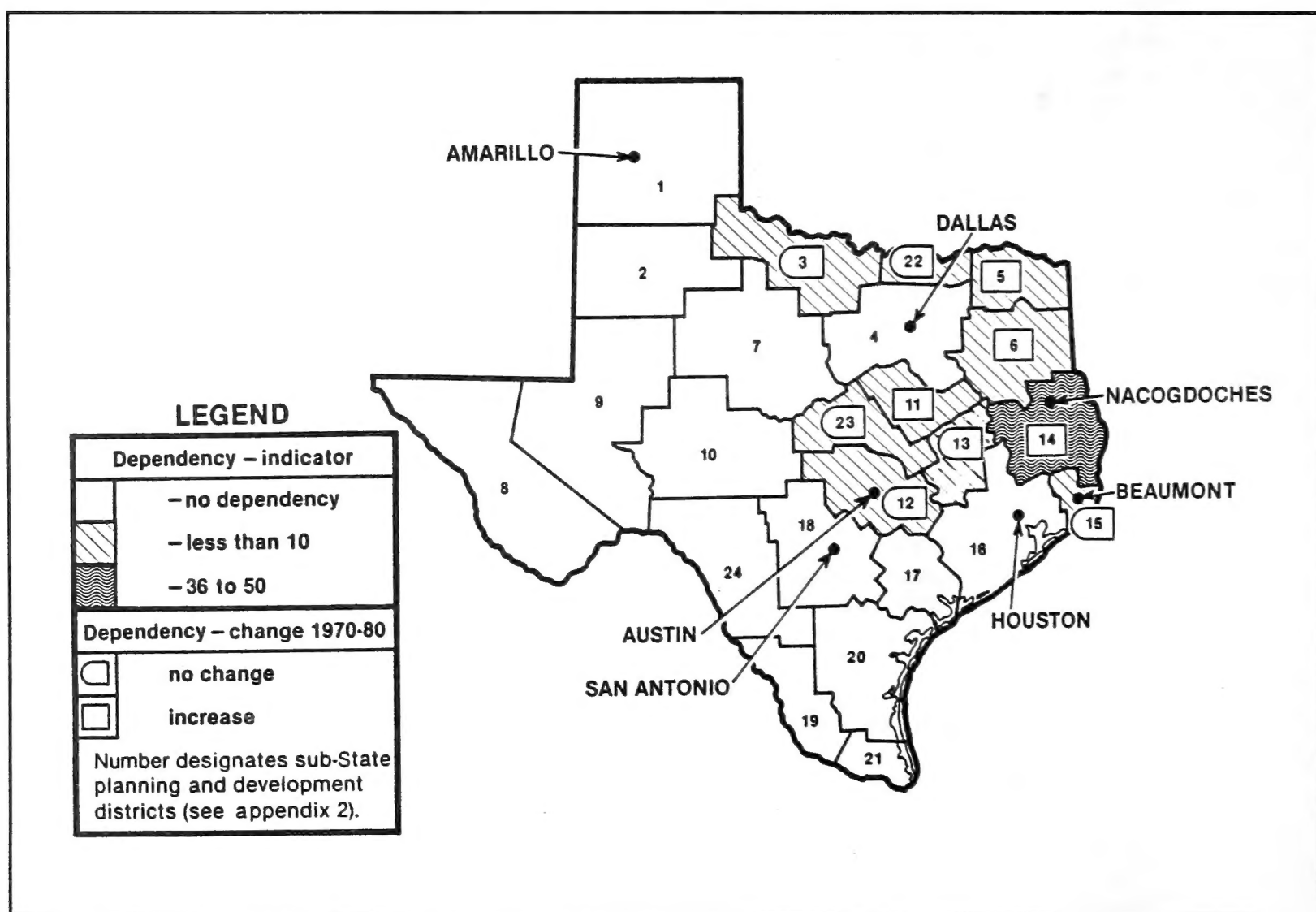
Both wholesale trade and retail trade qualify as basic industries; this is unusual and reflects Texas' role as one of the South's major regional trade centers.

The forest products industry does not qualify as a basic industry at the State level; but in some Sub-state localities, it accounts for a significant proportion of basic activities.

Economic base industries	Dependency indicator	
	1970	1980
	(Percent of economic base)	
Oil and gas extraction	17.6	31.6
Construction	8.7	22.5
Wholesale trade	10.4	11.8
Agriculture	12.0	7.2
Retail trade	4.6	5.1
Federal military	13.0	4.4
Petroleum refining	5.9	4.3
Electrical, gas, and sanitation services	2.1	2.5
Subtotal	74.3	89.4
All other basic industries	25.7	10.6
Total	100.0	100.0

Geographical Importance of the Forest Products Industry

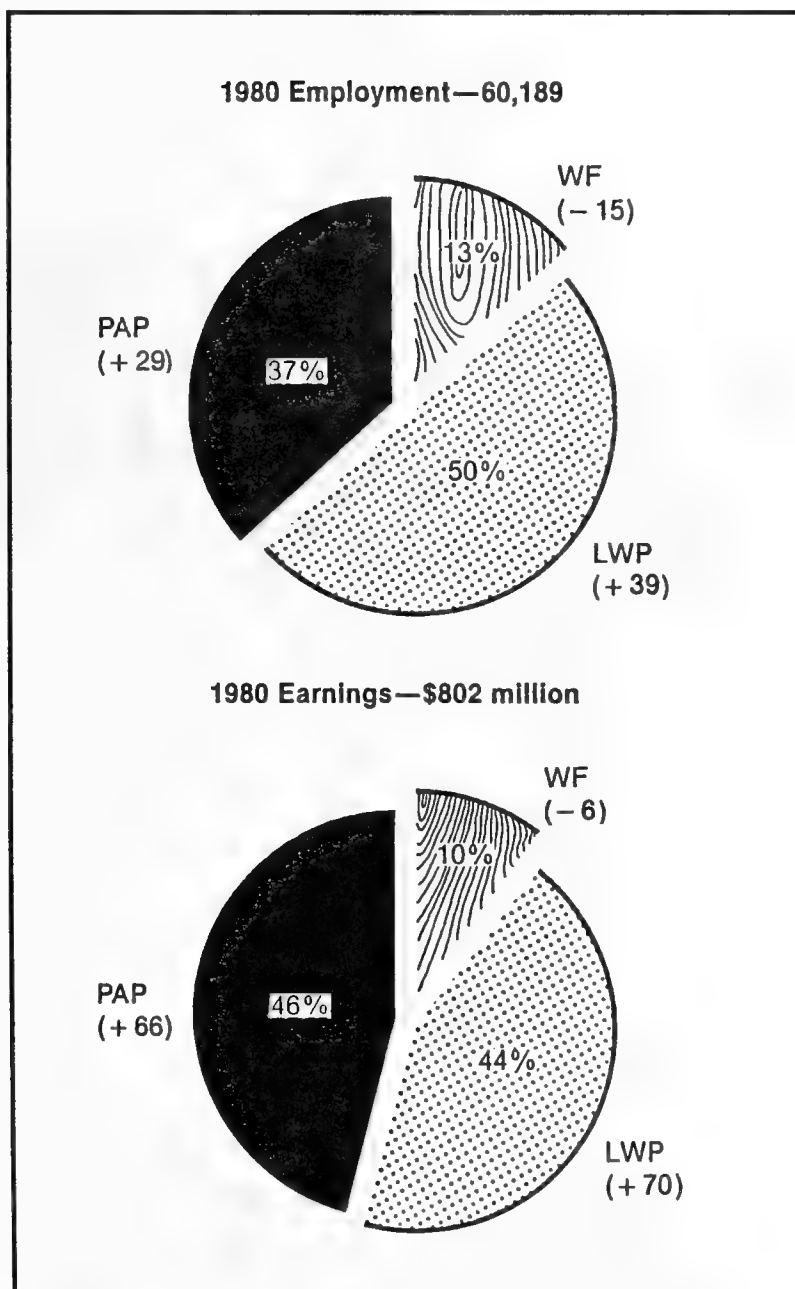
The contribution of the forest products industry to Texas' economic base varies considerably between sub-State districts (see appendix 2 for a list of counties by district). Of major significance is the concentration of secondary processing facilities (that is, those producing millwork, pallets, structural wood members, and converted paper and paperboard products) around the Dallas-Fort Worth and Houston-Beaumont urban areas. Although their respective forest products industries do not qualify as basic—and, therefore, are concealed—these areas account for over 40 percent of the State's employment in the forest products industry. Primary-processing operations for southern pine lumber, veneer, and plywood are concentrated in eastern Texas. The subdistrict area centered at Nacogdoches accounts for about 15 percent of the State's employment in the forest products industry.



Source: Sub-State estimates for 1970 and 1980 were derived from unpublished county data series provided by the U.S. Department of Commerce, Regional Economic Information System, Washington, DC, and from the Department's *County Business Patterns*. The numbers designate sub-State districts corresponding to the geographical classification of counties as shown in appendix 2.

Composition of the Forest Products Industry

Texas' forest products industry is comprised of paper and allied products, lumber and wood products (not including mobile homes), and wood furniture manufacturing. Employment decreased in the wood furniture segment between 1970 and 1980 and increased in the other two segments. The growth in employment in the lumber and wood products segment is particularly noteworthy because, while the southern pine plywood industry experienced a shakeout³ during the 1970's, solid-wood manufacturing continued to increase.



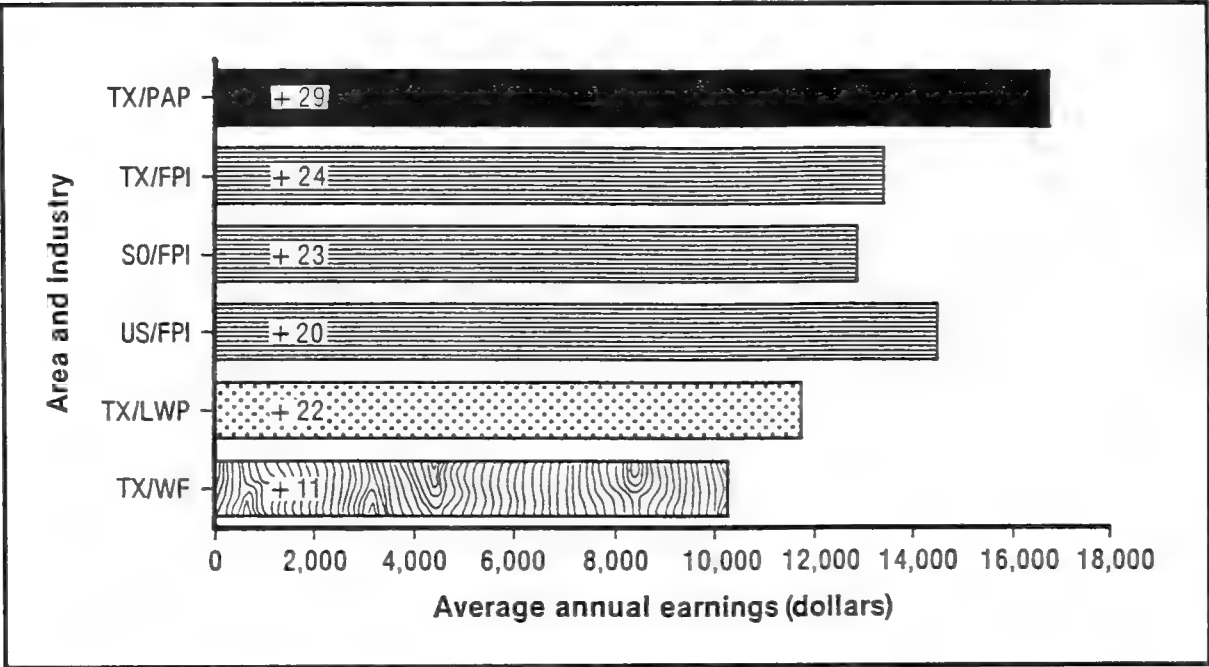
Numbers in parentheses show percentage of change from 1970 to 1980.

³ Shakeout is one of five fundamental stages of product-market development evolution: development, growth, shakeout, maturity-saturation, and decline. See, Cleaves, David A.; O'Laughlin, Jay. 1985. Forest inventory, plant location and company strategies. In: Proceedings of the 1985 Southern forest economic workers (SOFEW) workshop; 1985 March 13-15; Athens, GA. Athens GA: University of Georgia: 35-43.

**Average Annual
Earnings per Worker**

Average annual 1980 earnings per worker in paper and allied products were greater than were earnings in the other two segments of the forest products industry. Higher average skill levels, capital investment per worker, and unions account for this difference. Earnings in the wood furniture industry were less than 60 percent of those for paper and allied products and were significantly below the average for all forest products industries in the South and the United States.

The rate of growth in average earnings was greater for Texas' forest products industry than for the South and the Nation. The difference resulted from the growth in earnings of the paper and allied products segment. The rate of change for wood furniture was considerably less than that of the Nation and the South.

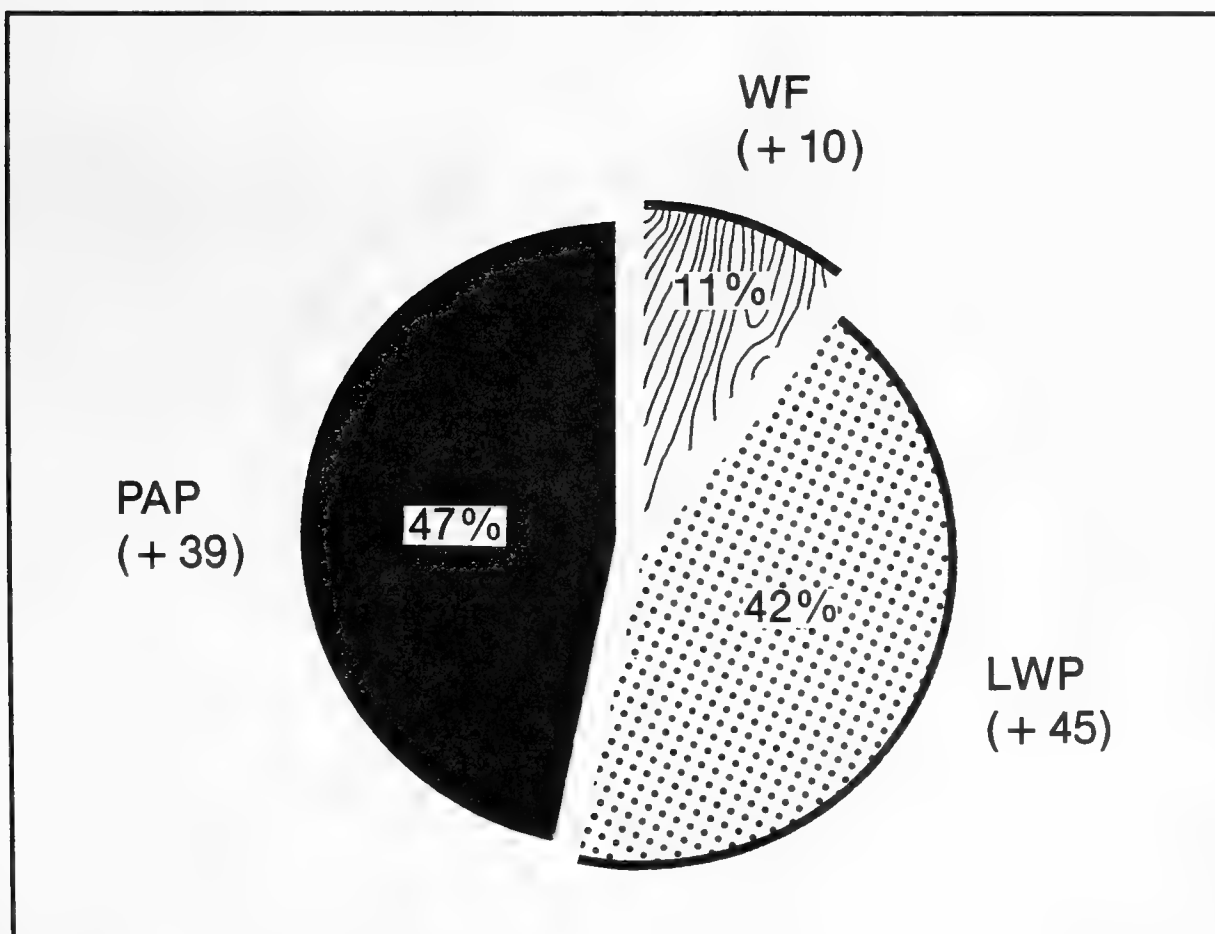


Numbers in bars show percentage of change from 1970 to 1980.

Value Added by the Forest Products Industry

Value added by manufacturing represents income payments made directly to workers and business owners. It is equal to the value of shipments less the cost of materials, parts, supplies, fuel, goods purchased for retail, electric energy, and contract work. Value of shipments includes goods and services provided by other industries; value added includes only the economic contributions of the State's manufacturing industries. Value added by manufacturing is therefore considered a better monetary gauge of the relative economic importance of a manufacturing industry. In 1977, paper and allied products had the largest share of the \$1.4 billion of value added by Texas' forest products industry.

In addition to the forest products industry experiencing above-average growth in employment, value added by the industry increased substantially between 1972 and 1977. Total value added increased by 38 percent; lumber and wood products experienced the most growth and wood furniture the least.



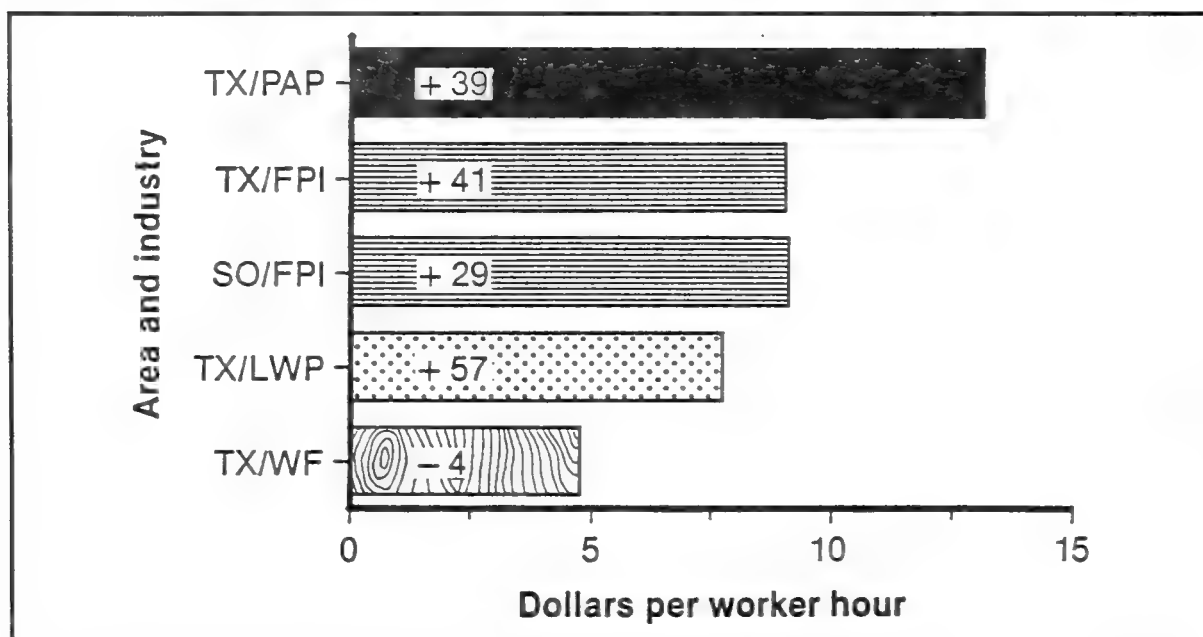
Numbers in parentheses show percentage of change from 1972 to 1977.

Capital Productivity

Increases in productivity are necessary for an industry to remain competitive in the marketplace. Productivity of an industry is measured in terms of value added minus payrolls per worker hour—VAMP (see table 3 for an explanation of how productivity was calculated for Texas' forest products industry). This measure of productivity represents profits before taxes and adjusts for wide differences in payroll among industries.

Paper and allied products had, by far, the highest productivity in Texas' forest products industry. Productivity per worker hour was almost 45 percent greater than the average for the State's forest products industry.

The lumber and wood products segment experienced the largest gain in productivity between 1972 and 1977. Paper and allied products is more capital intensive and, in the past, has attracted considerable investment in new facilities and equipment. During the mid-1970's, its productivity increased despite increased labor costs. This segment exhibited a larger gain in productivity than was average for the South.

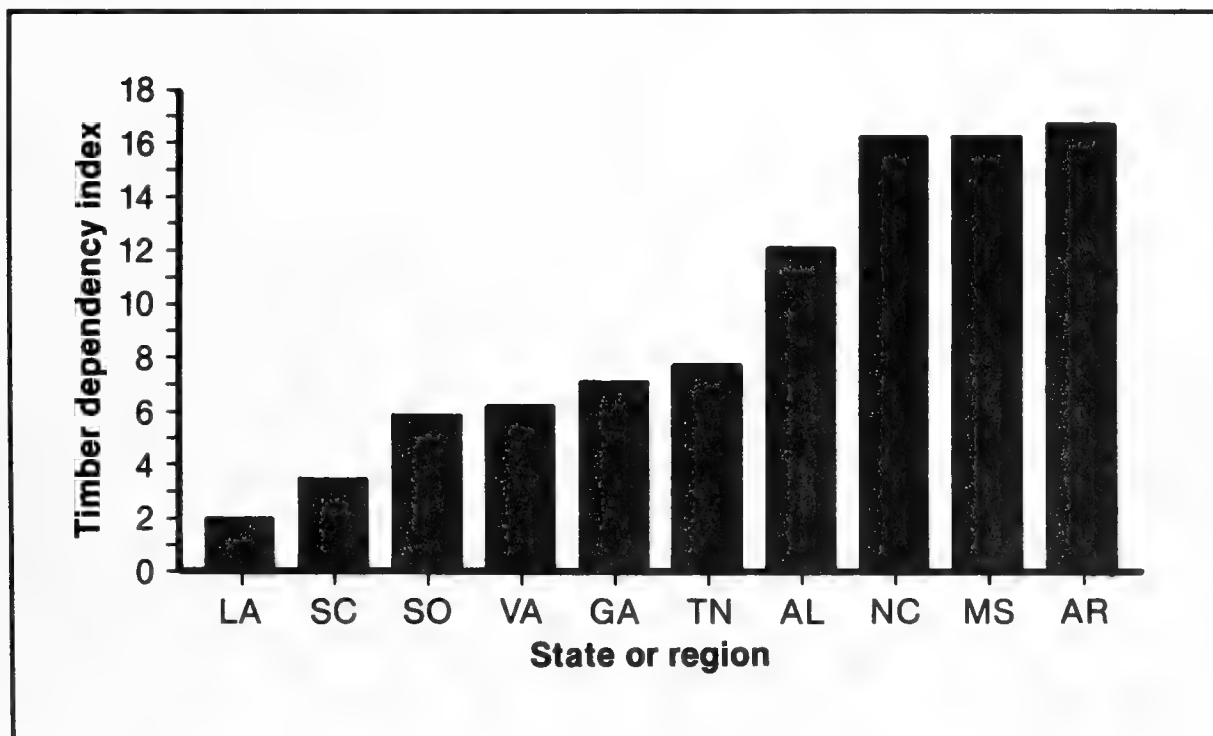


Numbers in bars show percentage of change from 1972 to 1977.

The Forest Products Industry in the South

Importance of the Industry Across the South

The dependency indicators suggest that in 1980 all but four States in the South manufactured forest products in excess of statewide needs. Florida, Kentucky, Oklahoma, and Texas were not self-sufficient in forest products; these States imported more forest products than they exported, so their respective forest products industries did not generate new dollars from the outside. In three States—Arkansas, Mississippi, and North Carolina—the forest products industry accounted for about one of six basic employees.

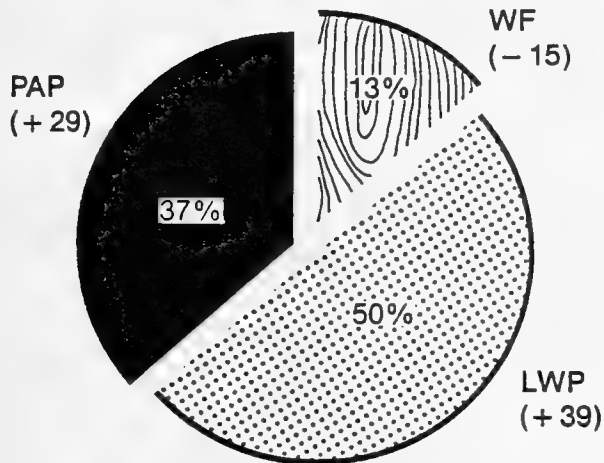


Industry Composition

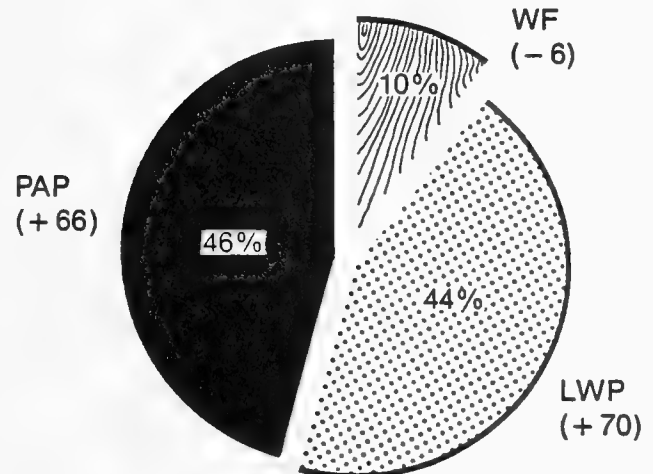
Both the paper and allied products and the lumber and wood product segments accounted for larger shares of 1980 employment and earnings in Texas' forest products industry than they did for the South. During the 1970's, employment in these two segments increased at a much faster rate in Texas than for the South. Employment in the wood furniture segment is much less prominent in Texas and the Nation than in the South in general; earnings and employment in wood furniture declined in Texas while they increased in the South and the Nation.

TEXAS

1980 Employment—60,189

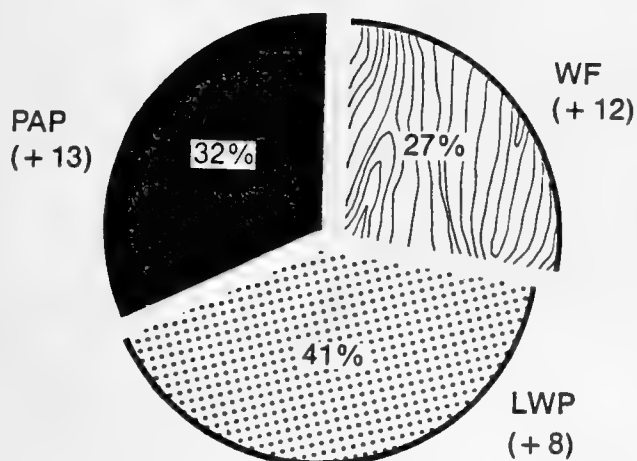


1980 Earnings—\$802 million



THE SOUTH

1980 Employment—620,567

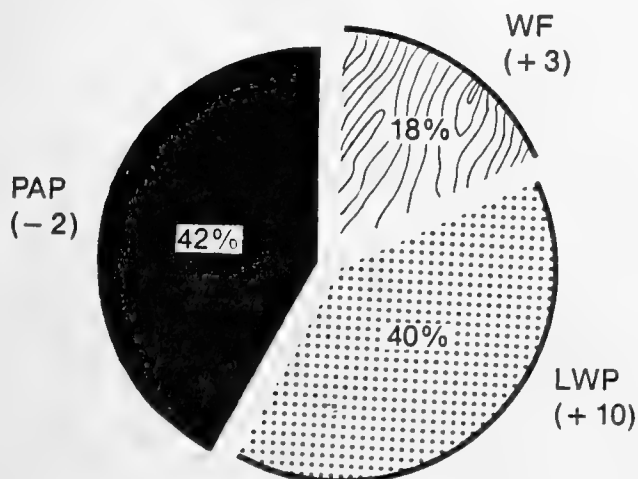


1980 Earnings—\$7.96 billion

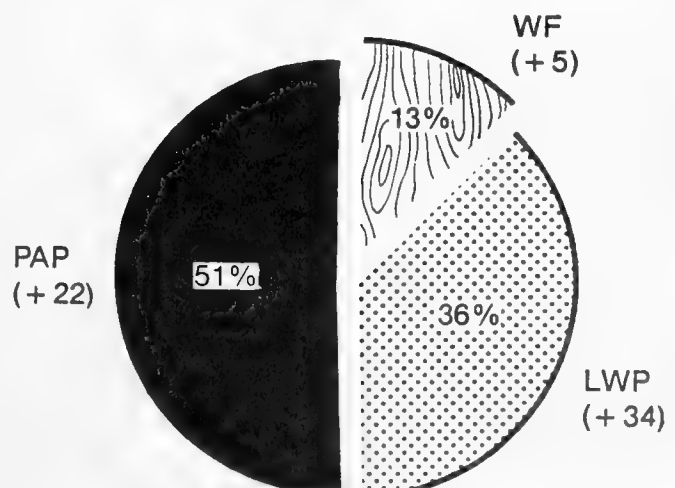


UNITED STATES

1980 Employment—1,634,000



1980 Earnings—\$23.65 billion

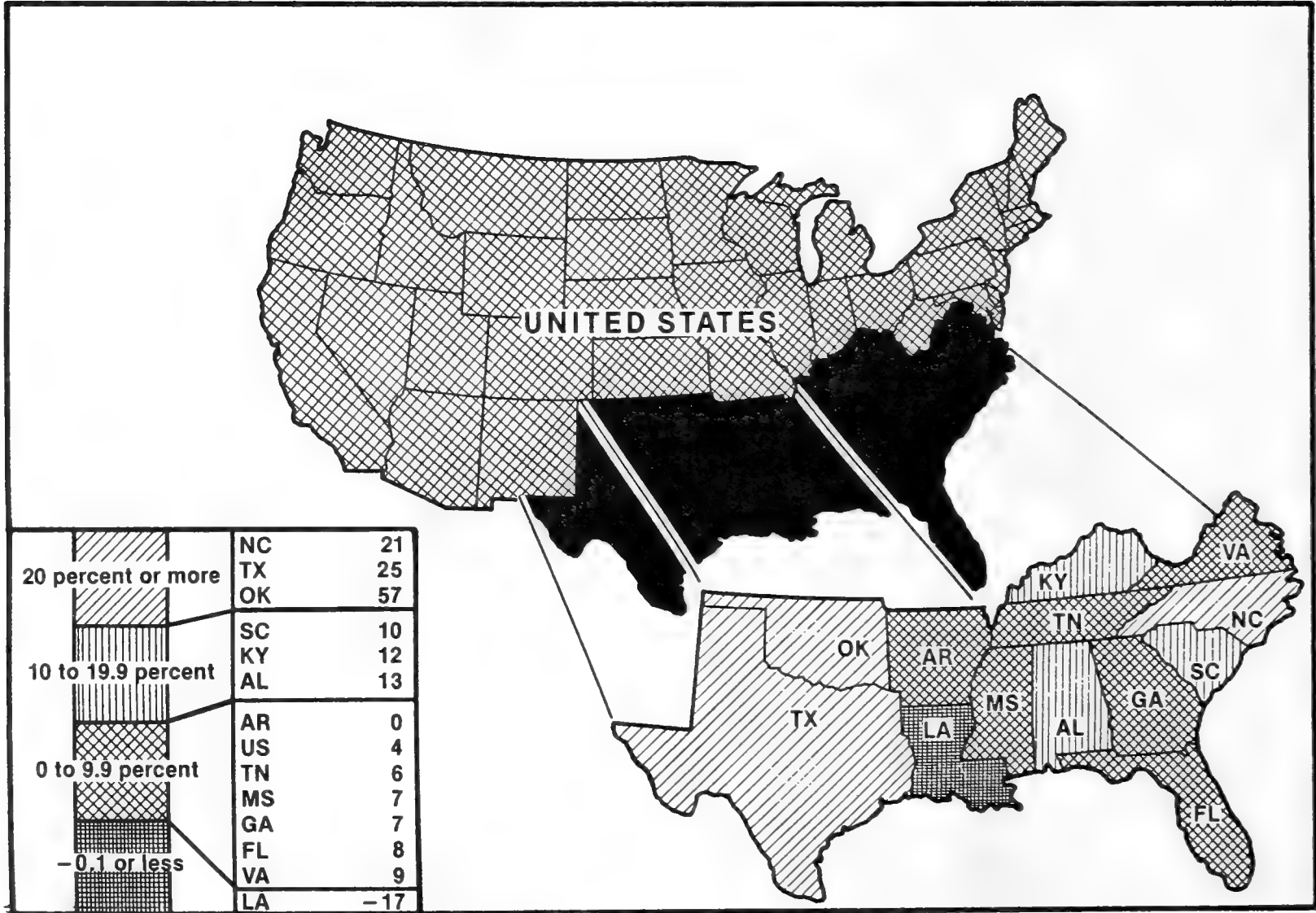


Numbers in parentheses show percentage of change from 1970 to 1980.

Growth of Employment

Between 1970 and 1980, employment in the forest products industry in Texas increased by more than 12,000. Only one Southern State, North Carolina, exhibited a larger absolute gain. Oklahoma had a larger relative change, but in absolute terms, Texas surpassed it by a wide margin.

Employment in the forest products industry in each of the Southern States except Arkansas and Louisiana grew faster than did the U.S. counterpart. Between 1970 and 1980, employment in Oklahoma and Texas grew faster than the all-industry average of 22.3 percent.

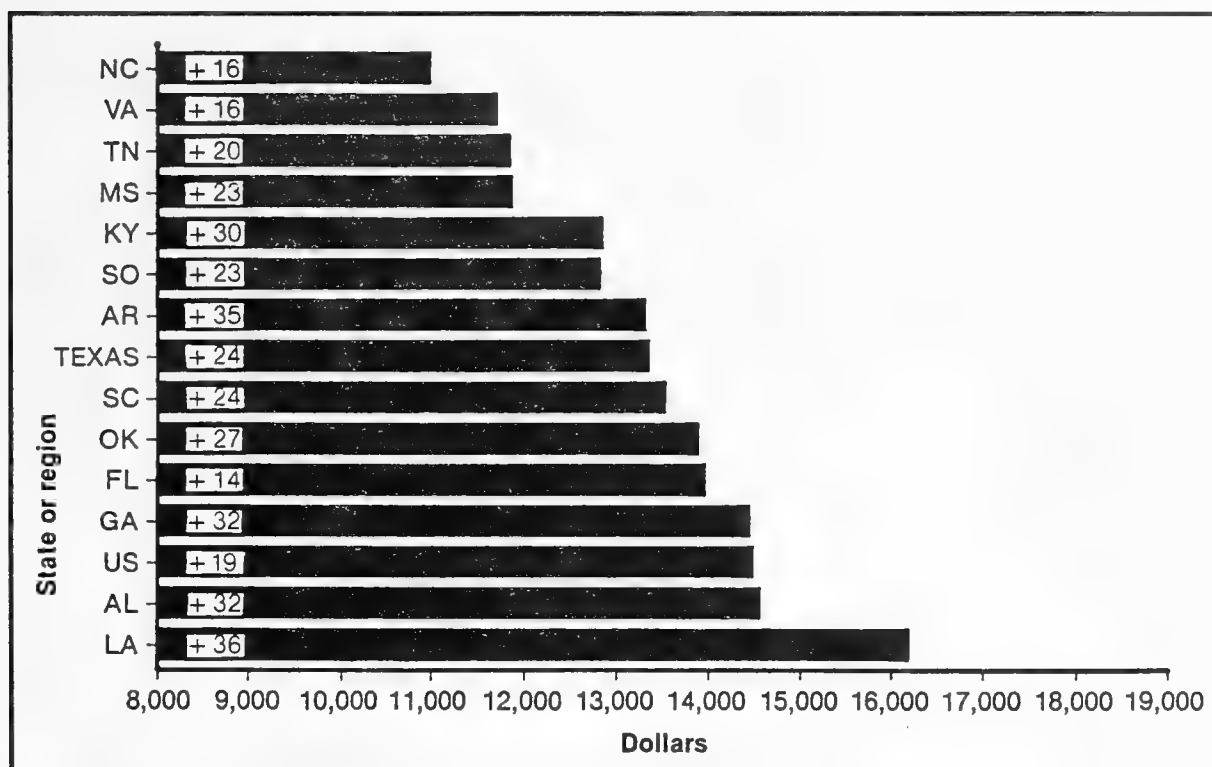


Average Annual Earnings

Average annual earnings per worker in the forest products industry differed significantly by State in 1980. About \$5,000 separated the State with the highest (Louisiana) from the State with the lowest (North Carolina). Pulp and allied products manufacturing, which has traditionally paid higher wages than have other segments of the forest products industry, dominated Louisiana's forest products industry. Wood furniture, which has paid lower average wages, dominated North Carolina's industry.

Average annual forest products industry earnings in Texas were slightly above the average for all States in the South but below the average for the United States. Furthermore, earnings increased faster in Texas than in either the South or the Nation.

Generally speaking, paper and allied products dominated the forest products industry in the States with the highest average annual earnings. This relation reflects higher job skills and unions in pulp and paper manufacturing. Wages, by and large, were the lowest in States where the labor-intensive wood furniture industry was more important



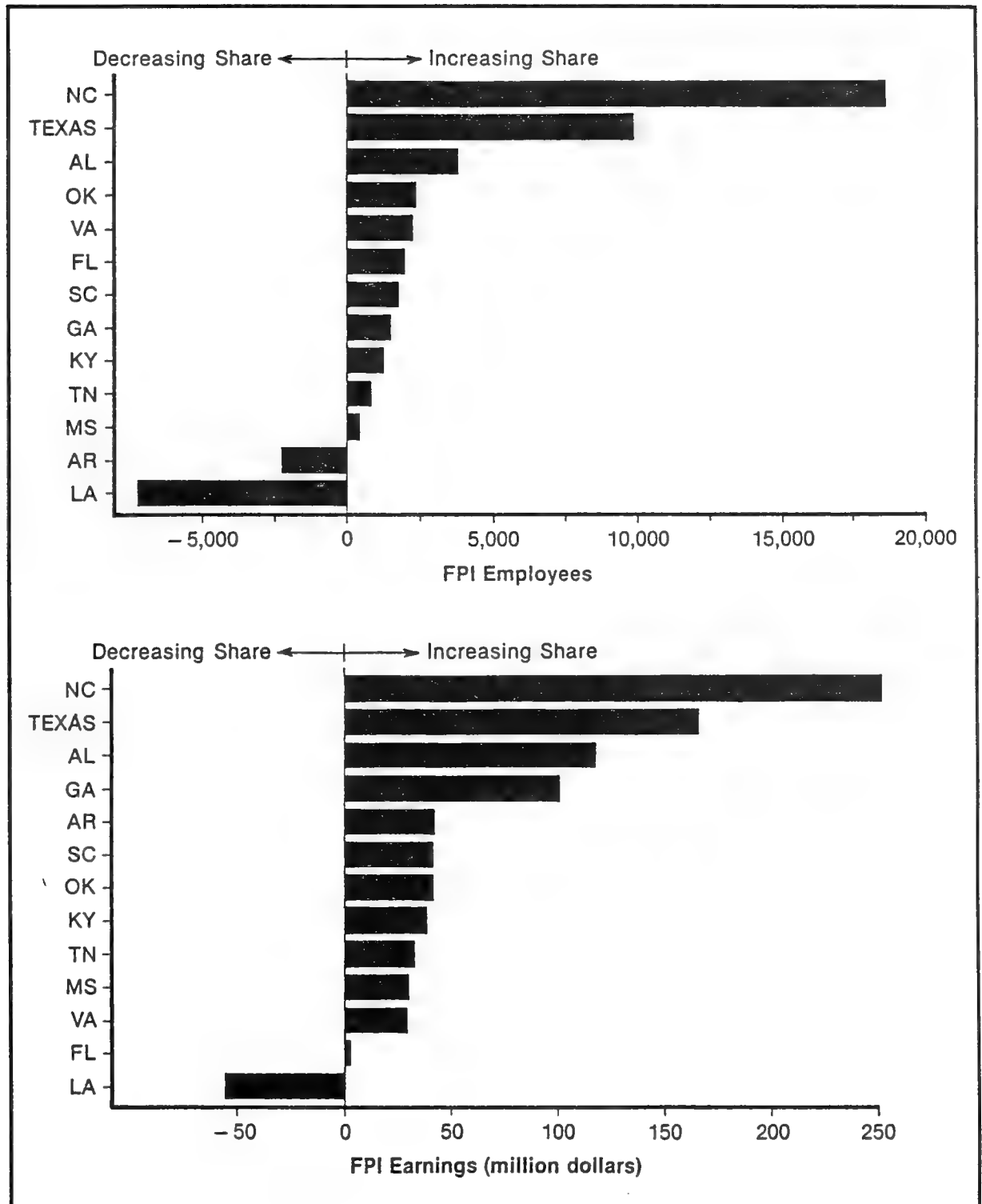
Numbers in bars show percentage of change from 1970 to 1980.

Shift in Employment and Earnings

The regional shift shows how much more or less employment and earnings a State would have had in the forest products industry in 1980 had it grown at the national rate. For example, Texas had nearly 10,000 more employees in 1980 than it would have had if its forest products industry had grown at the national rate.

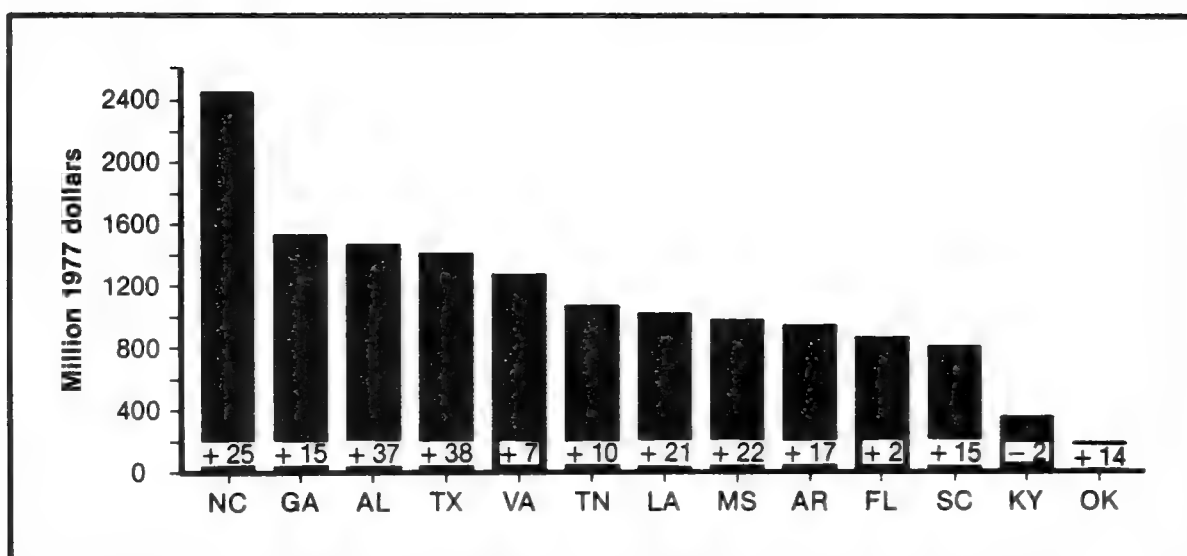
Between 1970 and 1980, total employment in the forest products industry remained constant. With the exception of Louisiana, it increased in every Southern State. All but Arkansas and Louisiana increased their share of the Nation's forest products industry employment, and all but Louisiana increased their share of earnings.

Increased shares of employment and earnings reflect the comparative advantage the South's forest products industry enjoyed over this industry in the rest of the Nation. Several factors (for example, relatively lower labor costs, lower raw materials costs, and closer proximity to markets) might account for a region's comparative advantage, although adverse trends in one factor need not reduce a region's advantage. In the South, increasing labor costs need not adversely affect a comparative advantage if those costs are offset by increased capital or labor productivity. For increased shares of both employment and earnings, Texas was second only to North Carolina in improving its comparative advantage during the 1970's.



Value Added by the Forest Products Industry

In 1977, the forest products industry of North Carolina produced more value added than any other State in the South. Georgia was second among the 13 Southern States; Texas was fourth. One state, Kentucky, produced less value added in 1977 than in 1972. This can be attributed to a decline in secondary processing activities during the 1970's.



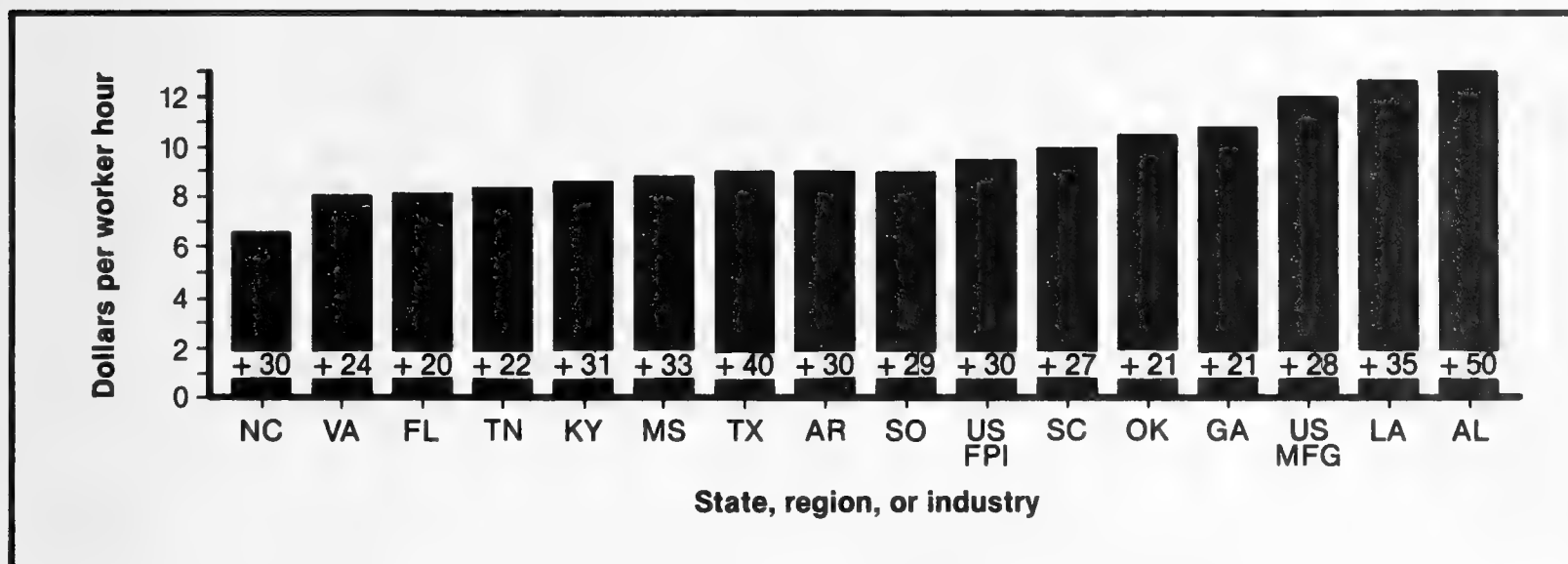
Numbers in bars show percentage of change from 1972 to 1977.

Capital Productivity

The paper and allied products segment, which is more capital-intensive and therefore more susceptible to technological change than are other segments of the forest products industry, exhibited the highest productivity within the forest products industry. Wood furniture, on the other hand, is the most labor-intensive of the three. North Carolina, for example, produced more value added than any other State in the South, but the productivity of its forest products industry in 1977 was the lowest, reflecting the dominant role of labor-intensive wood furniture manufacturing in North Carolina.

Increases in productivity exceeded increases in payroll per worker between 1972 and 1977 for all Southern States. This relation is partly responsible for the South's comparative advantage in the forest products industry.

In 1977, productivity of Texas' forest products industry was equal to the average for the 13 Southern States, but it was second only to Alabama in growth in productivity. This increase was achieved despite Texas' average annual wages being higher and growing faster than the average for the South.



Numbers in bars show percentage of change from 1972 to 1977.

Acknowledgment

Many helpful suggestions of several reviewers were incorporated in this research paper. This project was partially funded by the USDA Forest Service Resource Program and Assessment Staff, State and Private Forestry, Area Planning and Development, State Planning for Forest Resources.

Appendix 1 Tables

Table 1—Total labor and proprietorial employment and income, by industry, Texas, 1980¹

Industry number	Industry	Employees	Total income
		<i>Number</i>	<i>Thousand 1977 dollars²</i>
Wage and salary			
1	Agriculture	78,088	1,658,508
2	Agricultural services, forestry, and fisheries	52,074	393,764
3	Coal mining	651	16,977
4	Oil and gas extraction	228,984	5,089,383
5	Metal mining	1,245	21,145
6	Nonmetallic minerals	7,680	133,099
7	Construction	421,277	6,757,065
8	Food and kindred products	97,644	1,276,362
9	Tobacco	108	1,063
10	Textile mill production	5,753	62,435
11	Apparel and other textiles	74,864	583,614
12	Paper and allied products	22,103	368,334
13	Printing and publishing	62,409	764,209
14	Chemical and allied products	80,807	1,844,186
15	Petroleum refining	39,595	1,297,743
16	Rubber and miscellaneous plastics	30,755	433,040
17	Leather and leather products	8,314	71,181
18	Lumber and wood products, excluding mobile homes	30,066	352,218
19	Mobile homes	5,873	68,801
20	Wood furniture	8,020	81,960
21	Other furniture and fixtures	8,726	89,175
22	Stone, clay, and glass products	44,359	651,694
23	Primary metals	47,387	965,442
24	Fabricated metals	97,619	1,519,595
25	Machinery, excluding electrical	159,566	2,727,133
26	Electrical machinery	108,404	1,665,125
27	Transportation equipment, excluding motor vehicles	67,551	1,333,016
28	Motor vehicles	13,855	238,847
29	Instruments and related equipment	20,464	276,722
30	Miscellaneous manufacturing	13,393	151,832
31	Railroad transportation	30,089	603,711
32	Trucking and warehousing	93,639	1,512,911
33	Local transit	7,978	99,012

See footnotes at end of table.

Table 1—Total labor and proprietorial employment and income, by industry, Texas, 1980¹ (continued)

Industry number	Industry	Employees	Total income
		<i>Number</i>	<i>Thousand 1977 dollars²</i>
Wage and salary			
34	Air transportation	36,078	820,863
35	Pipeline transportation	5,534	130,802
36	Transportation services	14,133	233,093
37	Water transportation	21,951	392,001
38	Communications	83,658	1,456,618
39	Electric, gas, and sanitation services	69,268	1,323,369
40	Wholesale trade	418,530	6,999,093
41	Retail trade	1,020,143	8,679,661
42	Banking	87,047	1,064,998
43	Other credit agencies	59,223	1,089,946
44	Insurance	108,433	1,692,142
45	Real estate and combinations	82,014	961,900
46	Hotel and other lodging	61,676	438,178
47	Personal, miscellaneous business, and repair services	288,988	3,444,467
48	Auto repair service	38,661	552,341
49	Amusement	34,330	267,682
50	Motion pictures	10,140	71,257
51	Private households	128,422	369,051
52	Medical and other health	283,488	4,003,239
53	Private education	44,771	384,086
54	Nonprofit organizations	131,876	872,984
55	Miscellaneous services	98,148	2,675,867
56	Federal civilian	165,759	2,601,596
57	Federal military	187,602	1,525,579
58	State and local government	814,919	7,774,690
Proprietorial			
59	Nonfarm proprietors	462,612	6,193,605
60	Farm proprietors	210,433	1,240,771
	Total	6,937,177	90,369,181

¹ Source of data for this table for Texas, other States of the South, and the United States: unpublished data, U.S. Department of Commerce, Regional Economics Measurements Division, Regional Economic Information System (REIS), Washington, DC, 1982. Unpublished data used by the U.S. Department of Commerce in preparing their County Business Patterns (CBP) series on employment and payroll were used to differentiate wood-related from nonwood-related employment and earnings. For example, CBP data were used to separate mobile homes (no. 19, above) from the lumber and wood products (no. 18) industry. Wood furniture (no. 20) was similarly separated from other furniture and fixtures (no. 21).

² The Personal Consumption Expenditure (CPE) deflator, 1977 = 100, was used to deflate nominal dollars.

Table 2—Calculation of 1980 dependency indexes for Texas

(In percent)

Industry	Employment		Texas excess employment ¹	Dependency index ²
	Texas	United States		
Agriculture	1.30	1.46	—	—
Agricultural services, forestry, and fisheries	.87	.62	0.25	2.47
Farm proprietors	3.51	3.03	.48	4.73
Coal mining	.01	.27	—	—
Oil and gas extraction	3.82	.60	3.22	31.62
Metal mining	.02	.11	—	—
Nonmetallic minerals	.13	.14	—	—
Construction	7.03	4.74	2.28	22.47
Food and kindred products	1.63	1.87	—	—
Tobacco	—	.07	—	—
Textile mill production	.10	.93	—	—
Apparel and other textiles	1.25	1.39	—	—
Paper and allied products	.37	.76	—	—
Printing and publishing	1.04	1.37	—	—
Chemical and allied products	1.35	1.22	.13	1.28
Petroleum refining	.66	.22	.44	4.33
Rubber and miscellaneous plastics	.51	.80	—	—
Leather and leather products	.14	.26	—	—
Lumber and wood products, excluding mobile homes	.50	.71	—	—
Mobile homes	.10	.05	.05	.49
Wood furniture	.13	.32	—	—
Other furniture and fixtures	.15	.19	—	—
Stone, clay, and glass products	.74	.73	.01	.09
Primary metals	.79	1.26	—	—
Fabricated metals	1.63	1.77	—	—
Machinery, excluding electrical	2.66	2.73	—	—
Electrical machinery	1.81	2.31	—	—
Transportation equipment, excluding motor vehicles	1.13	1.21	—	—
Motor vehicles	.23	.87	—	—
Instruments and related equipment	.34	.77	—	—
Miscellaneous manufacturing	.22	.47	—	—
Railroad transportation	.50	.58	—	—
Trucking and warehousing	1.56	1.40	.16	1.59
Local transit	.13	.29	—	—
Air transportation	.60	.50	.10	1.02
Pipeline transportation	.09	.02	.07	.68
Transportation services	.24	.22	.01	.12
Water transportation	.37	.23	.14	1.34
Communications	1.40	1.48	—	—
Electric, gas, and sanitation services	1.16	.90	.25	2.48
Wholesale trade	6.98	5.79	1.20	11.77

See footnotes at end of table.

Table 2—Calculation of 1980 dependency indexes for Texas (continued)

(In percent)

Industry	Employment		Texas excess employment ¹	Dependency index ²
	Texas	United States		
Retail trade	17.02	16.50	.52	5.10
Banking	1.45	1.72	—	—
Other credit agencies	.99	.99	—	—
Insurance	1.81	1.89	—	—
Real estate and combinations	1.37	1.16	.21	2.05
Hotel and other lodging	1.03	1.20	—	—
Personal, miscellaneous business, and repair services	4.82	4.69	.13	1.26
Auto repair service	.65	.63	.02	.15
Amusement	.57	.84	—	—
Motion pictures	.17	.24	—	—
Medical and other health	4.73	5.71	—	—
Private education	.75	1.47	—	—
Nonprofit organizations	2.20	3.01	—	—
Miscellaneous services	1.64	1.63	.01	.03
Federal civilian	2.77	3.27	—	—
Federal military	3.13	2.68	.45	4.42
Nonfarm proprietors	7.72	7.66	.06	.55
Total ³	100.00	100.00	10.17	100.00

¹ Texas minus U.S. employment. Figures may not be exactly equal to Texas minus U.S. because of rounding. Dashes signify no excess employment.

² Individual industry excess employment expressed as a percentage of Texas' total excess employment (sum of column 4).

³ Sum of parts may not equal totals because of rounding.

Table 3—Value added, hours worked, payroll, and capital productivity,¹ Texas forest products industry, 1977²

Industry	Value added	Payroll	Hours worked	Productivity	Productivity change, 1972-77
	-- \$Million --		Million	\$VAMP per hour	Percent
Lumber and wood products	600.4	248.9	46.0	7.64	+57.01
Wood furniture	150.6	80.0	15.0	4.71	-3.56
Paper and allied products	663.0	272.0	30.0	13.03	+39.45

¹ Productivity equals value added minus payroll (VAMP) divided by hours worked. For a discussion of VAMP, see W. Charles Sawyer and Joseph A. Ziegler. 1980. "The use of VAMP shift as a predictive model." Unpublished paper presented at the annual meeting of the Western Regional Science Association, Monterey, California.

² Source: U.S. Bureau of the Census, Census of Manufactures, for 1972 and 1977, Texas and the United States, available in 1976 and 1980, respectively. In the few instances where data were not available for some subindustry segments, the distribution of the number of establishments was used to estimate nondisclosures.

Appendix 2

Texas Counties by Sub-State Planning and Development Districts

District code	Counties
1	Armstrong, Briscoe, Carson, Castro, Collingsworth, Dallam, Deaf Smith, Donley, Gray, Hall, Hansford, Hartley, Hemphill, Hutchinson, Lipscomb, Moore, Ochiltree, Oldham, Parmer, Potter, Randall, Roberts, Sherman, Swisher, Wheeler
2	Bailey, Cochran, Crosby, Dickens, Floyd, Garza, Hale, Hockley, King, Lamb, Lubbock, Lynn, Motley, Terry, Yoakum
3	Archer, Baylor, Childress, Clay, Cottle, Foard, Hardeman, Jack, Montague, Wichita, Wilbarger, Young
4	Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Jonson, Kaufman, Navarro, Palo Pinto, Parker, Rockwall, Somervell, Tarrant, Wise
5	Bowie, Cass, Delta, Franklin, Hopkins, Lamar, Morris, Red River, Titus
6	Anderson, Camp, Cherokee, Gregg, Harrison, Henderson, Marion, Panola, Rains, Rusk, Smith, Upshur, Van Zandt, Wood
7	Brown, Callahan, Coleman, Comanche, Eastland, Fisher, Haskell, Jones, Kent, Knox, Mitchell, Noland, Runnels, Scurry, Shackelford, Stephens, Stonewall, Taylor, Throckmorton
8	Brewster, Culberson, El Paso, Hudspeth, Jeff Davis, Presidio
9	Andrews, Borden, Crane, Dawson, Ector, Gaines, Glasscock, Howard, Loving, Martin, Midland, Pecos, Reeves, Terrell, Upton, Ward, Winkler
10	Coke, Concho, Crockett, Irion, Kimble, Mason, McCulloch, Menard, Reagan, Schleicher, Sterling, Sutton, Tom Green
11	Bosque, Falls, Freestone, Hill, Limestone, McLennan
12	Bastrop, Blanco, Burnet, Caldwell, Fayette, Hays, Lee, Llano, Travis, Williamson
13	Brazos, Burleson, Grimes, Leon, Madison, Robertson, Washington
14	Angelina, Houston, Jasper, Nacogdoches, Newton, Polk, Sabine, San Augustine, San Jacinto, Shelby, Trinity, Tyler
15	Hardin, Jefferson, Orange
16	Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller, Wharton
17	Calhoun, De Witt, Goliad, Gonzales, Jackson, Lavaca, Victoria
18	Atascosa, Bandera, Bexar, Comal, Frio, Gillespie, Guadalupe, Karnes, Kendall, Kerr, Medina, Wilson
19	Jim Hogg, Starr, Webb, Zapata
20	Aransas, Bee, Brooks, Duval, Jim Wells, Kenedy, Kleburg, Live Oak, McMullen, Nueces, Refugio, San Patricio
21	Cameron, Hidalgo, Willacy
22	Cooke, Fannin, Grayson
23	Bell, Coryell, Hamilton, Lampasas, Milam, Mills, San Saba
24	Dimmit, Edwards, Kinney, La Salle, Maverick, Real, Uvalde, Val Verde, Zavala

Schallau, Con H; Maki, Wilbur R.; Foster, Bennett B.; Redmond, Clair H.
1987. Texas' forest products industry: performance and contribution to the State's economy, 1970 to 1980. Res. Pap. PNW-RP-389. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 22 p.

Even though Texas consumes more forest products than it produces, its forest products industry has a conspicuous record. Between 1970 and 1980, employment in the forest products industry increased by 12,000. Only one Southern State, North Carolina, showed a larger absolute gain. Texas was also second to North Carolina in improving its comparative advantage during the 1970's. In 1977, it ranked fourth among the 13 Southern States in value added, but first in growth of value added.

Keywords: Forest products industries, economics (forest products industries), employment (forest products industries), Texas.

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December 1987



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